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IN-DEPTH PERSPECTIVE

ENVIRONMENTAL CHARACTERIZATION REPORT FOR AREA PROPOSED FOR REMOVAL FROM SITE

Former Pacific Powder Site, Maytown, Wasington

Prepared for: Citifor, Inc.

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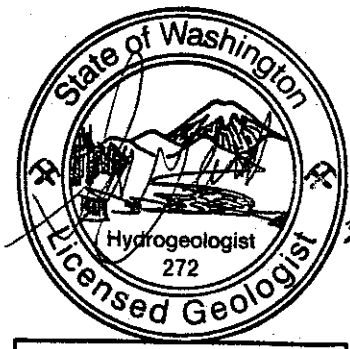
Aspect Consulting, LLC



Steve J. Germiat, LHG, CGWP
Associate Hydrogeologist
sgermiat@aspectconsulting.com

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1 Report Objective and Organization

This report presents the environmental characterization results for a portion of the Former Pacific Powder Site (Site), a 1,625-acre property located at 13120 Tilley Road South in Maytown, Washington (Figure 1). Approximately 100 acres of the property were occupied by a dynamite manufacturing plant from the early 1940s until 1968. From the late 1960s until 1994, Ammonium Nitrate Fuel Oil (ANFO - a mixture of ammonium nitrate and fuel oil) and slurry explosives were manufactured at the property. A culvert production facility also operated on the property from approximately 1976 through the mid-1980s.

The property owner, Citifor Inc., entered into an Agreed Order (No. 02TCPSR-4523) with the Washington State Department of Ecology (Ecology) to conduct a remedial investigation (RI) and feasibility study (FS) of soil and groundwater quality at the Site. The Agreed Order defined the Site by the extent of contamination caused by the release of hazardous substances at the Site. The Agreed Order did not specifically exclude from the definition of Site any portion of the 1,625-acre property. The Agreed Order included an RI/FS Work Plan (Hart Crowser 2004) and its Addendum (Aspect Consulting 2005) that outlined a comprehensive environmental characterization program for the property. The characterization program for much of the property has been completed in accordance with the RI/FS Work Plan.

The objective of this report is to define that portion of the property that has not been contaminated by any release of hazardous substances. Citifor Inc. requests that Ecology remove that portion of the property from the Site as defined in the Agreed Order. Redefining the Site to exclude a large area of uncontaminated property would allow more focused and efficient completion of the RI/FS process for the Site.

The following sections of this report describe the following:

- The portion of the property proposed for removal from the Site;
- Environmental characterization results for that portion of the property; and
- Conclusion.

Appendix A to this report describes field procedures for collection of the characterization data in accordance with the RI/FS Work Plan. Appendix B presents the analytical data quality review and copies of the laboratory reports. Note that this report incorporates data collected during the Phase II environmental assessment of the property completed by Hart Crowser in 2002-2003. Information from the Phase II assessment report (Hart Crowser 2003) is included and referenced in this report where appropriate

2 Area Proposed for Removal from the Site

During the approximately 50-year time period that the property was used for explosives manufacturing, the manufacturing processes occurred within the north-central part of the 1,625-acre property. The portion of the property outside of this manufacturing core consisted primarily of undeveloped land with a number of locations for storage, testing, and burning of materials associated with the manufacturing operations. Figure 2 labels the major areas involved in the historical manufacturing processes on the property.

We propose that the shaded area of the property within the black boundary line, as shown on Figure 2, would remain as the Site. All of the property surrounding the central shaded area is proposed for removal from the Site, and is hereafter referred to in this report as the "subject parcel". Areas within the subject parcel that were associated with historical manufacturing operations that have had environmental characterization completed include (see Figure 2):

- A spur of the Standard Gauge Railroad;
- Magazines 1, 2, 3, and 4;
- Barricaded Area;
- Late 80s/Early 90s Era Berm;
- Former Hercules Office (Caretaker Residence);
- Farm House Burn Pit;
- Trailer Storage Areas 1, 2, 3, and 4;
- Burn Areas 1 and 2; and
- Seismic Pond.

In addition, a systematic surface soil sampling grid, not focused on specific areas, was completed across much of the subject parcel (Figure 2).

In January 2004, a soil quality characterization was completed for the northeast corner of the property, within the subject parcel (Aspect Consulting 2004). The area included in that characterization is shown on Figure 2. Following review of the characterization results, Ecology concluded that the northeast corner area had not been adversely impacted and required no cleanup (letter from Mike Blum dated February 20, 2004).

The RI/FS Work Plan (Hart Crowser 2004) and its January 2005 Amendment (Aspect Consulting 2005) describe in detail the Site history, previous environmental investigations and cleanup activities completed, and the soil and groundwater quality characterization to be completed in the RI. The reader is referred to the RI/FS Work Plan for that detailed discussion. The history and corresponding soil/groundwater quality characterization objectives and methods for each area within the subject parcel are reiterated, prior to discussing the characterization results, in Section 3 of this report.

3 Characterization Results for Subject Parcel

This characterization incorporates sampling and analysis data collected in 2002-2003 during the Phase II environmental assessment (Hart Crowser 2003), as well as the data specified in the RI/FS Work Plan, which were collected in August through December 2005. Appendix A to this report describes field procedures for collecting the RI sampling data.

3.1 Analytical Data Quality Review

Based on independent review of the RI and Phase II analytical data, all analytical data used in this RI are of suitable quality for their intended purposes. Appendix B provides the data quality review for the RI data, along with copies of the analytical laboratory's original data reports. The Phase II environmental assessment report (Hart Crowser 2003) presents the data quality review for data collected during that assessment.

3.2 Screening Levels

Consistent with the RI/FS Work Plan, the analytical results for soil are compared to the most stringent soil quality criteria in MTCA (Chapter 173-340 WAC): MTCA Method A unrestricted soil cleanup levels, Method B unrestricted direct contact soil cleanup levels, and MTCA ecological indicator soil concentrations for protection of terrestrial wildlife. Table 1 includes the soil screening levels.

Analytical results for the Seismic Pond groundwater sample are compared against screening levels that include MTCA groundwater cleanup levels based on drinking water use and, because of the sample location's proximity to a wetland, MTCA surface water cleanup levels and state surface water quality standards (Chapter 173-201A WAC). Table 11 includes the groundwater screening levels.

3.3 Property-Wide Surface Soil Sampling Grid

Objectives

To evaluate potential aerial dispersion of arsenic and lead associated with the burning of site structures during plant decommissioning, surface soil samples were collected downwind of the explosives production and magazine areas. According to the National Climatic Data Center, for the period from 1930 until 1996, the predominant wind direction for the nearest climate station (Olympia) during each month was from the south-southwest. Therefore, areas north-northeast of the locations where buildings were burned would have been expected to have greatest probability of impact, if such aerial transport of arsenic and lead occurred. Sampling of surface soils was also conducted south of the production and magazine areas to address potential aerial deposition during atypical wind conditions.

Sampling and Analysis Completed

A staggered 500-foot grid was established across the northern and central portion of the property (Figure 2). One surface soil (upper 6 inches) sample was collected at each grid location; grid sample locations within the subject parcel are shown on Figure 2. Within the subject parcel, samples GRID-2D, -10D, -14D, -14L, -15K, -17C, -17K, -19C, -19K, -21C, and -27K were relocated from the pre-determined grid locations to be at least 20 feet from roads, railroad grades, structures, steep slopes, or wetlands, in accordance with the RI/FS Work Plan. Grid locations located within 100 feet of other existing or proposed surface soil samples being tested for total arsenic and lead were not sampled, in accordance with the RI/FS Work Plan. In August 2005, a total of 113 surface soil samples were collected on this grid within the subject parcel, including 22 on the bluff north of the existing Tacoma Rail Mountain Division railroad tracks. These soil samples were analyzed for total arsenic and lead. Grid samples collected south of the Tacoma Rail Mountain Division railroad tracks were also screened for the presence of energetics/explosives compounds using the EXPRAY™ colorimetric test kit.

Sampling and Analysis Results

Arsenic concentrations in the subject parcel ranged from less than 2.5 (not detected) to 17.2 mg/kg. Lead concentrations ranged from 2.7 to 95.5 mg/kg (Table 2). The detected arsenic and lead concentrations are below MTCA Method A unrestricted soil cleanup levels (20 mg/kg and 250 mg/kg for arsenic and lead, respectively). The concentrations are also below MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (132 mg/kg and 118 mg/kg for arsenic and lead, respectively; Table 1).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results from the systematic property-wide grid indicate that soil quality across the subject parcel, outside of manufacturing-related locations discussed below, is not adversely impacted.

3.4 Standard Gauge Railroad Spur within Subject Parcel

Objectives

Surface soil sampling was conducted along the standard gauge railroad (SGRR) spur leading from the Tacoma Rail Mountain Division railroad tracks to the MEAN plant area (Figure 2). The primary objective of this task was to evaluate whether potential applications of herbicides have impacted soil quality along the SGRR.

Sampling and Analysis Completed

Prior to sampling, the location of this SGRR corridor was surveyed by a licensed surveyor using coordinates derived from the base map in the RI/FS Work Plan. The northern portion of this SGRR grade spur is visible, near its junction with the off-site operating railroad tracks (Tacoma Rail Mountain Division). Further to the south, there is little if any visible evidence of the former SGRR grade.

In September 2005, discrete surface (upper 6 inches) soil samples were collected at three transects spaced at approximately 300-foot intervals along the SGRR corridor (Figure 3). At each of the three transects, three surface soil samples were collected in a line perpendicular to the SGRR alignment: one in the middle of the alignment and one on each side of the alignment, approximately 15 feet from the middle sample. The three samples collected in the middle of the alignment were identified SGRR-6, SGRR-7, and SGRR-8. Corresponding samples collected on the sides of the alignment had A and B suffixes added to the sample identifications (e.g., SGRR-6A and SGRR-6B; Figure 3).

The nine discrete soil samples were submitted for analysis of total arsenic and lead. As outlined in the RI/FS Work Plan, samples collected from the SGRR alignments across the property were also selected for chlorinated herbicide analyses based on higher natural organic matter contents (from visual observation). None of the nine SGRR samples collected within the subject parcel were selected for chlorinated herbicide analyses; however, analysis for chlorinated herbicides was conducted on sample SGRR-9, located along this SGRR spur approximately 300 feet south of SGRR-8 (i.e., outside the subject parcel). Surface soil samples were also screened in the field for the presence of explosives using the EXPRAY™ colorimetric test kit.

Sampling and Analysis Results

Arsenic was not detected in any of the nine soil samples. Lead concentrations ranged from 7.1 to 14.4 mg/kg, well below the 250 mg/kg MTCA Method A unrestricted soil cleanup level and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife. Table 1 summarizes the range of soil concentrations relative to the respective soil screening levels. Table 3 presents all of the soil quality data for the SGRR spur.

Although the nine samples were not analyzed for chlorinated herbicides, chlorinated herbicides were not detected in any of the seven soil samples collected along the SGRR and narrow gauge railroad grades (NGRR) across the whole property (all outside the subject parcel). This includes the sample SGRR-9 collected on this SGRR spur at the MEAN Plant, approximately 300 feet south of sample SGRR-8. The collective information indicates that chlorinated herbicides were not applied on the SGRR at this property, including within the subject parcel. The data collected outside the subject parcel will be presented in a subsequent report.

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality along this SGRR spur is not adversely impacted.

3.5 Magazines 1, 2, 3, and 4

Objectives

Surface soil sampling at the Magazines 1, 3, and 4 locations was completed as part of the Phase II investigation (Hart Crowser 2003). At the time of the Phase II, the location of Magazine 2 was misidentified as a barricaded area southwest of the MEAN Plant Area;

this barricaded area is discussed in Section 3.6. The actual location of Magazine 2 was later determined to be in the southeastern corner of the site (Figure 2).

Dyno Nobel's magazine decommissioning documents indicate that the walls and flooring of the magazine buildings were constructed of wood (Ken Dunkin of APPCO indicated that Magazine 2 had a concrete foundation). No visible evidence of the magazine buildings (e.g., wood or metal debris) remains except for a concrete pad at the Magazine 1 location. Because of their age, it is highly likely that the magazine structures contained lead-based paint. If the magazine structures did contain lead-based paint, their burning could have deposited lead particulate on the inner walls of the berms immediately surrounding the structure. If such burning occurred, we expect that the highest lead concentrations would have been present on these inner berm soils.

In accordance with the RI/FS Work Plan, additional soil samples were collected from Magazines 3 and 4 to verify that soil quality in the adjacent berm has not been impacted (there is no berm remaining at Magazine 1). Because Magazines 3 and 4 have been a part of the explosives manufacturing process as long as the explosives plant has existed, were burned as part of demolition, and have existing soil berms still in place, they provide useful information regarding potential for dispersal of lead associated with the burning. The Magazine 2 location was also sampled to evaluate potential releases of metals from the burning of the structure and possible application of herbicides.

Sampling and Analysis Completed

Surface soil sampling and analysis performed at the four magazine locations is summarized below. Sample locations at each magazine location are shown on Figure 4.

Magazine 1

As part of the Phase II Environmental Assessment, Hart Crowser collected five discrete soil samples at the Magazine 1 location in December 2002 (MAG1-SS1 through -SS5; Figure 4). The five samples were analyzed for eight total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). One sample, MAG1-SS2, was also analyzed for semivolatile organics (SVOCs) and nitroaromatics-nitroamines.

Magazine 2

Aspect Consulting collected six discrete surface (upper 6 inches) soil samples at the magazine location in August 2005 (Figure 4). The six soil samples were analyzed for total arsenic and lead. To evaluate the potential for chlorinated organic herbicide use, sample MAG2-SS11 was selected for analysis of chlorinated herbicides based on its higher natural organic matter content (based on visual observation). Note that the five soil samples collected from the barricaded area southwest of the MEAN plant were labeled MAG2-SS1 through -SS5 in the Phase II assessment (Section 3.6). Therefore, the six RI soil samples were labeled MAG2-SS10 through -SS15 to maintain unique soil sample identifications (Table 4).

Magazine 3

In December 2002, Hart Crowser collected five discrete surface soil samples at the Magazine 3 location (MAG3-SS1 through -SS5; Figure 4). The five samples were

analyzed for eight total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). One sample, MAG3-SS3, was also analyzed for SVOCs and nitroaromatics-nitroamines.

Aspect Consulting collected five discrete surface soil samples at the Magazine 3 location for analysis of total arsenic and lead, and two samples for analysis of total arsenic only. Samples MAG3-SS7, –SS8, –SS9, and –SS11 were collected from the adjacent inner berm walls. Sample MAG3-SS12 was collected from the floor of the magazine location. Sample MAG3-SS6 was collected from soil next to a stormwater sump within the berm, and sample MAG3-SS10 was collected from soil in the bottom of the sump (Figure 4). The sump consisted of a 4-foot diameter steel culvert covered with a heavy steel grate. Soils in the sump bottom, approximately 3.5 feet below surrounding grade, appeared to be typical of those on the site (slightly silty, sandy gravel).

Magazine 4

Five discrete surface soil samples (MAG4-SS1 through –SS5) were collected from the floor of the Magazine 4 location in December 2002 as part of the Phase II investigation (Hart Crowser 2003). The samples were submitted for analysis of eight total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). One of the samples, MAG4-SS1, was selected based on the presence of finer-grain materials for analysis of semivolatile organics (SVOCs; EPA Method 8270) and nitroaromatics-nitroamines (EPA Method 8330).

Aspect Consulting collected three additional discrete surface soil samples (MAG4-SS6, –SS7, and –SS8) from the inside of the Magazine 4 berm in August 2005. These soil samples were analyzed for total arsenic and lead. Following discussion of the Magazine 4 data with Ecology, three additional surface samples were collected in December 2005 for analysis of total lead (MAG4-SS9, –SS10, and –SS11). The Magazine 4 sample locations are shown on Figure 4.

Sampling and Analysis Results

Table 1 summarizes the range of soil concentrations for each of the magazines relative to soil screening levels. Table 4 presents all of the soil quality data for the magazines. The data are described below by magazine.

Magazine 1

Metals concentrations in the soil samples were as follow (Table 4):

- Arsenic: 4.2 to 13.7 mg/kg;
- Cadmium: Less than 0.067 (non-detect) to 0.19 mg/kg;
- Chromium: 18.1 to 24.6 mg/kg;
- Copper: 19.4 to 24.6 mg/kg;
- Lead: 5.85 to 62 mg/kg;
- Mercury: 0.036 to 0.074 mg/kg;
- Nickel: 17.8 to 25.4 mg/kg; and

- Zinc: 36.6 to 71.6 mg/kg.

The detected metals concentrations are below respective MTCA unrestricted soil cleanup levels and respective MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (Table 1).

One SVOC, benzoic acid, was detected in sample MAG1-SS2 (Table 4). The estimated concentration of benzoic acid was 0.62 mg/kg, six orders of magnitude below the MTCA Method B unrestricted direct contact soil cleanup level (320,000 mg/kg; Table 1).

No nitroaromatics-nitroamines were detected in sample MAG1-SS2 (Table 4).

The sampling and analysis results indicate that soil quality at the Magazine 1 location is not adversely impacted.

Magazine 2

Arsenic was not detected in any of the six samples. Lead concentrations ranged from 4.2 to 16.8 mg/kg (Table 4). The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level and below the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife (Table 1).

No chlorinated herbicides were detected in sample MAG2-SS11 (Table 4). EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at the Magazine 2 location is not adversely impacted.

Magazine 3

Metals concentrations in the soil samples were as follow (Table 4):

- Arsenic: less than less than 6 (non-detect) to 24 mg/kg;
- Cadmium: 0.092 to 0.36 mg/kg;
- Chromium: 18.5 to 31.9 mg/kg;
- Copper: 17.2 to 24.9 mg/kg;
- Lead: 4.3 to 39 mg/kg;
- Mercury: 0.027 to 0.055 mg/kg;
- Nickel: 17.9 to 22 mg/kg; and
- Zinc: 35.3 to 270 mg/kg.

The detected concentrations for seven of the eight metals (cadmium, chromium, copper, lead, mercury, nickel, and zinc) are below respective MTCA unrestricted soil cleanup levels. The detected arsenic concentration in one of the twelve soil samples, 24 mg/kg in MAG3-SS4, is above the 20 mg/kg MTCA Method A unrestricted soil cleanup level (Table 1). However, the arsenic concentrations in Magazine 3 soil comply with the Method A cleanup level, applying the MTCA 3-part compliance criteria (WAC 173-340-740):

1. The average arsenic concentration for the twelve Magazine 3 soil samples, expressed as the 95 percent upper confidence level (95% UCL) on the mean, is 14 mg/kg, below the 20 mg/kg cleanup level. The MTCAstat output for the 95% UCL calculation is provided in Appendix C;
2. No sample concentration is more than two times the 20 mg/kg cleanup level; and
3. Less than 10 percent (1/12 samples or 8 percent) of the sample concentrations are above the 20 mg/kg cleanup level.

The concentrations of all metals are below respective MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (Table 1).

Benzoic acid was the only SVOC detected in sample MAG3-SS3, detected at an estimated concentration of 0.54 mg/kg (Table 4). This is six orders of magnitude below the 320,000 mg/kg MTCA Method B unrestricted direct contact soil cleanup level (Table 1)

No nitroaromatics-nitroamines were detected in sample MAG3-SS3 (Table 4). EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at the Magazine 3 location is not adversely impacted

Magazine 4

Metals concentrations in the soil samples were as follow (Table 4):

- Arsenic: less than 6 mg/kg;
- Cadmium: less than 0.2 mg/kg;
- Chromium: 12.8 to 16.9 mg/kg;
- Copper: 15.3 to 17.9 mg/kg;
- Lead: 6.2 to 195 mg/kg;
- Mercury: 0.024 to 0.039 mg/kg;
- Nickel: 15.7 to 18.5 mg/kg; and
- Zinc: 29.6 to 34.2 mg/kg.

The detected metals concentrations in the soil samples are below MTCA unrestricted soil quality criteria (Method A or Method B; Table 1). The concentrations are also below MTCA ecological indicator soil concentrations for protection of terrestrial wildlife with the exception of one sample. Sample MAG4-SS6, located on the northern portion of the berm (Figure 4), had a lead concentration of 195 mg/kg (field duplicate was 214 mg/kg). This lead concentration is below the 250 mg/kg MTCA Method A soil cleanup level but above the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife. This soil sample visually appeared no different from the other berm soil samples collected.

The lead concentrations in Magazine 4 soil comply with the ecological screening level, applying the MTCA 3-part compliance criteria (WAC 173-340-740):

1. The average lead concentration for the eleven Magazine 4 soil samples, expressed as the 95 percent upper confidence level (95% UCL) on the mean, is 54 mg/kg, below the 118 mg/kg ecological screening level. The MTCAstat output for the 95% UCL calculation is provided in Appendix C;
2. No sample concentration is more than two times the 118 mg/kg ecological screening level; and
3. Less than 10 percent (1/11 samples or 9 percent) of the sample concentrations are above the 118 mg/kg ecological screening level.

Soil sample MAG4-SS1 contained low detectable concentrations of polycyclic aromatic hydrocarbons (PAHs) including the carcinogenic PAHs (cPAHs) benzo(a)pyrene, benzo(b,k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene (Table 4). Applying Toxicity Equivalency Factors (TEFs) to the cPAH concentration per MTCA regulations, the TEF-adjusted total cPAH concentration of 0.054 mg/kg is below the Method A unrestricted soil cleanup level of 0.1 mg/kg. The low-level PAHs are likely combustion by-products resulting from burning of the magazine structure.

In addition to the PAHs, soil sample MAG4-SS1 contained detectable concentrations of three other SVOCs (carbazole, dibenzofuran, and benzoic acid); these concentrations (up to 0.98 mg/kg) are orders of magnitude below available MTCA unrestricted direct contact soil cleanup levels (Table 1).

No nitroaromatic-nitroamine compounds were detected in sample MAG4-SS1 (Table 4). EXPRAY™ screening at the August 2005 soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at the Magazine 4 location is not adversely impacted.

3.6 Barricaded Area Southwest of MEAN Plant

Objectives

At the time of the Phase II environmental assessment, the barricaded area southwest of the MEAN Plant Area was misidentified as the location of Magazine 2. As described in the RI/FS Work Plan Addendum (Aspect Consulting 2005), Mr. Bill Garson, an employee at the Site for many years, was interviewed in January 2005 regarding his knowledge of historical operations at the site. In that interview, Mr. Garson mentioned that this area contained a small building known as the Pest House. The building was used to store open packages of explosives until they could be repackaged or disposed of. This area was sampled in the Phase II assessment to evaluate whether burning activities or potential applications of herbicides have impacted soil quality there.

Sampling and Analysis Completed

Five discrete soil samples were collected at the Barricaded Area in December 2002 (MAG2-SS1 through -SS5; Figure 5). The six samples were analyzed for eight total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). Two samples, MAG2-SS2 and MAG2-SS6, were also analyzed for SVOCs and nitroaromatics/nitroamines. Because those data indicated no concentrations above soil screening levels, additional sampling at this location was not included in the RI/FS Work Plan.

Sampling and Analysis Results

Metals concentrations were as follow (Table 5):

- Arsenic: 3.3 to 6.9 mg/kg;
- Cadmium: 0.075 to 0.72 mg/kg;
- Chromium: 14.9 to 29 mg/kg;
- Copper: 20.8 to 27.3 mg/kg;
- Lead: 3.9 to 10.2 mg/kg;
- Mercury: 0.019 to 0.052 mg/kg;
- Nickel: 15 to 22.3 mg/kg; and
- Zinc: 29.3 to 49.1 mg/kg.

The detected concentrations are below respective MTCA Method A and Method B unrestricted soil cleanup levels, and respective MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (Table 1).

Benzoic acid was the only SVOC detected in samples MAG2-SS2 and MAG2-SS6 (0.58 mg/kg and 2.56 mg/kg, respectively; Table 5). The concentrations are at least five orders of magnitude below the 320,000 mg/kg MTCA Method B unrestricted soil cleanup level.

No nitroaromatics-nitroamines were detected in samples MAG2-SS2 or MAG2-SS6 (Table 5).

The sampling and analysis results indicate that soil quality at this Barricaded Area is not adversely impacted.

3.7 Late 80s/Early 90s Era Berm

Objectives

Review of aerial photographs indicates that this bermed location several hundred feet north of Magazine 3 (Figure 2) was constructed in the late 1980s or early 1990s. Ken Duncan (APPCO) thought this bermed location may have been used sparingly to store packaged explosives shipments (ANFO) pending transport. Soil sampling and analysis was completed to evaluate potential for soil quality impacts.

Sampling and Analysis Completed

Six discrete surface (upper 6 inches) soil samples were collected from this bermed location in August 2005 (BERM-SS1 to -SS6; Figure 6). Three discrete soil samples were collected from the flat area inside the berm and three samples were collected from the inner walls of the surrounding soil berm. The six samples were analyzed for diesel- and oil-range total petroleum hydrocarbons (TPH) by the NWTPH-D extended method, and for total arsenic and lead. Soil samples were also screened for the presence of energetics/explosives compounds using the EXPRAY™ colorimetric test kit.

Sampling and Analysis Results

Arsenic was not detected in any of the six samples. Lead concentrations ranged from 2.97 to 13.6 mg/kg (Table 6). The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level, and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife (Table 1).

Diesel-range TPH concentrations were less than 25 mg/kg. Oil-range TPH concentrations ranged from 9.08 to 260 mg/kg; however, all of the reported oil-range concentrations above 150 mg/kg were qualified by the laboratory as not resembling typical petroleum product based on the chromatogram fingerprint (X2 qualifier; Table 6). No petroleum odors or staining were observed in the soil samples. This information, in combination with our independent review of the NWTPH-D chromatograms, indicates that the reported diesel- and oil-range TPH concentrations are primarily attributable to non-petroleum compounds (natural organics and/or burned wood), consistent with the lab's interpretation. The last section of Appendix B provides discussion of the chromatogram evaluation for all of the TPH data collectively.

In any event, the detected diesel- and oil-range TPH concentrations are well below their MTCA Method A unrestricted soil cleanup levels (both 2,000 mg/kg). The diesel-range TPH concentrations are also below the 6,000 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife (based on residual saturation) (Table 1) MTCA does not provide an ecological indicator concentration for oil-range TPH (WAC 173-340-900 Table 749-3); however, it would presumably be based on residual saturation as the diesel-range TPH indicator concentration is, and be higher than the diesel-range value (i.e., above 6,000 mg/kg).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at the Late 80s/Early 90s Era Berm location is not adversely impacted.

3.8 Former Hercules Office (Caretaker Residence)

Objectives

A portion of the Former Hercules Office located near the entrance gate was reportedly used as a laboratory (Figure 2). This building is currently used as the residence for the caretaker of the property. Although laboratory operations conducted by Hercules at the site were reportedly controlled and did not produce mercury releases, sampling and

analysis was performed around this reported former laboratory location to evaluate potential for soil quality impacts.

Sampling and Analysis Completed

Four discrete surface soil samples were collected around the perimeter of the existing building (one from each side) in August 2005 (FHO-SS1 through -SS4; Figure 6). The samples were analyzed for total arsenic, lead, and mercury. Soils at the sample locations were also screened in the field for the presence of energetics/explosives compounds using the EXPRAY™ colorimetric test kit.

Sampling and Analysis Results

Arsenic was not detected in any of the 4 samples. Lead concentrations ranged from 3.7 to 7.3 mg/kg. Mercury concentrations ranged from non-detect (less than 0.017) to 0.026 mg/kg (Table 7). The concentrations are below MTCA Method A unrestricted soil cleanup levels (250 mg/kg and 2 mg/kg for lead and mercury, respectively). The concentrations are also below MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (118 mg/kg and 5.5 mg/kg for lead and mercury, respectively; Table 1).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at the Former Hercules Office is not adversely impacted.

3.9 Farm House Burn Pit

Objectives

During cleanup operations conducted by Dyno Nobel, burned blasting caps and copper wire were encountered in a small (10- by 10- by 4-foot) pit located next to the old farmhouse site (Figure 2). Dyno Nobel stated in its 1994 cleanup report and associated field reports that, although it appeared that old electronic detonators were burned in the pit, excavation and testing activities did not encounter unburned caps or "hazardous contaminants." No soil quality testing data for this area were provided in the report so the number of samples collected and type of testing performed following excavation are not known. Citifor's former consultant (Mark Johns of Exponent), who was on site periodically during Dyno Nobel's cleanup activities, confirmed the burn pit location in the field during preparation of the RI/FS Work Plan. An accumulation of burned wire at the surface remained at the former burn pit location. Soil sampling and analysis was included as part of the RI/FS Work Plan to evaluate whether the burning of electronic detonators had impacted soil quality at this location.

Sampling and Analysis Completed

In August 2005, two 20-foot long trenches were excavated perpendicular to each other across the location of the former burn pit (Figure 7). The trenches were installed to a depth of 5 feet to search for potential electrical debris or visual evidence of

contamination. No subsurface debris or visual evidence of contamination was encountered.

Five soil samples were collected in a cross-shaped grid pattern from the trenches at depths of 4 to 5 feet below ground surface – just below the reported depth of the former pit. One soil sample was collected at the intercept of the trenches with the remaining four samples collected approximately 10 feet from the center sample (Figure 7). The five subsurface soil samples were analyzed for eight total metals (arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc), nitroaromatics-nitroamines, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs).

Sampling and Analysis Results

Arsenic, cadmium, and mercury were not detected in the five samples. Concentrations for the other five metals were as follows (Table 8):

- Chromium: 12.5 to 24.3 mg/kg
- Copper: 18.2 to 57.7 mg/kg
- Lead: 2.06 to 14.9 mg/kg
- Nickel: 19 0 to 24.2 mg/kg
- Zinc: 25.3 to 33.5 mg/kg

The detected concentrations are below respective MTCA unrestricted soil cleanup levels, and below respective MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (Table 1).

One nitroaromatic compound, 1,3,5-trinitrobenzene, was detected at low estimated concentrations (0.020 and 0.024 mg/kg) in two of the five soil samples (Table 8). The detected concentrations are several orders of magnitude below the 210,000 mg/kg MTCA Method B unrestricted soil cleanup level (Table 1).

PCBs and PAHs were not detected in any of the five samples (Table 8).

The sampling and analysis results indicate that soil quality at the Farm House Burn Pit location is not adversely impacted.

3.10 Trailer Storage Areas 1, 2, 3, and 4

Objectives

Trailer Storage Areas 1 and 4 (Figure 2) were identified in the RI/FS Work Plan based on review of aerial photographs and other historical information (Hart Crowser 2004). Ken Dunkin (APPCO) indicated that these areas were used to store trailers with packaged explosive product (ANFO) He indicated there was no product handling or spillage in these areas, just trailer storage of material that needed to be reworked in the plant (off-specification material) At the time the RI/FS Work Plan was prepared, the historical use of Trailer Storage Areas 2 and 3 was not certain, and they were referred to as unidentified disturbed areas based on their identification from aerial photographs As part of the January 2005 interview, Mr. Bill Garson indicated that the two previously unidentified

disturbed areas along the road between Magazine 1 and Trailer Storage Area 4 were also trailer storage areas. These areas have been designated as Trailer Storage Areas 2 and 3 (Figure 2). No previous environmental investigations or cleanup activities are known to have occurred at these four locations. Soil sampling and analysis was completed to evaluate soil quality at each of these four areas.

Sampling and Analysis Completed

At the larger Trailer Storage Areas 1 and 4, five discrete surface soil samples were collected in August 2005. At the smaller Trailer Storage Areas 2 and 3, three discrete soil samples were collected. Soil sample locations and designations for the four areas are shown on Figure 8. At each of the four areas, samples were collected from the upper 6 inches of soil in a spatially distributed pattern, and analyzed for diesel- and oil-range TPH and total arsenic and lead. The soil samples were also screened in the field for the presence of energetic/explosive compounds using the EXPRAY™ colorimetric test kit.

Sampling and Analysis Results

Trailer Storage Area 1

Arsenic was not detected in any of the five samples (TS1-SS1 through -SS5; Figure 8). The detected lead concentrations ranged from 6.96 to 10.7 mg/kg (Table 9). The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level, and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife (Table 1).

Reported diesel-range TPH concentrations ranged from 9.4 to 47.6 mg/kg. However, detected concentrations above 18.5 mg/kg were qualified by the laboratory as not resembling typical petroleum product (X2 qualifer; Table 9). Reported oil-range TPH concentrations ranged from 41.1 to 355 mg/kg. However, two of three detected concentrations at or above 150 mg/kg were qualified by the laboratory as not resembling typical petroleum product (Table 9). Oil-range TPH concentrations in sample TS1-SS4 and its field duplicate were not qualified by the lab (355 and 194 mg/kg, respectively; Table 9).

No petroleum odors or staining were observed in the soil samples. This information, in combination with independent review of the NWTPH-D chromatograms, indicates that all but one of the reported diesel- and oil-range TPH concentrations are likely attributable to non-petroleum compounds (natural organics and/or burned wood), consistent with the lab's interpretation. The chromatogram for sample TS1-SS4 exhibits an oil-product signature along with natural organics, consistent with the lab not qualifying the reported oil-range TPH concentration (355 mg/kg) in this sample (Table 9). The last section of Appendix B provides discussion of the chromatogram evaluation for the TPH data.

In any event, the detected diesel-range and oil-range TPH concentrations are below their MTCA Method A unrestricted soil cleanup levels and the MTCA ecological indicator soil concentration for protection of terrestrial wildlife (2,000 mg/kg and 6,000 mg/kg, respectively).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at Trailer Storage Area 1 is not adversely impacted.

Trailer Storage Area 2

Arsenic was not detected in any of the three samples (TS2-SS1 through -SS3; Figure 8). The detected lead concentrations ranged from 5.88 to 6.94 mg/kg. The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife

Diesel-range TPH concentrations ranged from 6.96 to 18 mg/kg. Oil-range TPH concentrations ranged from 35.3 to 86.2 mg/kg; the highest concentration was qualified by the lab as not resembling typical product (Table 9). The detected concentrations are below MTCA Method A unrestricted soil cleanup levels and below the MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (2,000 and 6,000 mg/kg, respectively).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds

The sampling and analysis results indicate that soil quality at Trailer Storage Area 2 is not adversely impacted.

Trailer Storage Area 3

Arsenic was not detected in any of the three samples (TS3-SS1 through -SS3; Figure 8). The detected lead concentrations ranged from 6.2 to 7.3 mg/kg (Table 9). The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife

Diesel-range TPH concentrations were less than 24.7 mg/kg. Oil-range TPH concentrations ranged from 19 to 163 mg/kg; however, the highest concentration was qualified by lab as not resembling typical petroleum product (Table 9). The detected diesel- and oil-range TPH concentrations are well below MTCA Method A unrestricted soil cleanup levels and below MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (2,000 and 6,000 mg/kg, respectively).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at Trailer Storage Area 3 is not adversely impacted.

Trailer Storage Area 4

Arsenic was not detected in any of the five samples (TS4-SS1 through –SS5; Figure 8). The detected lead concentrations ranged from 4.3 to 6.4 mg/kg (Table 9). The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife.

Diesel-range TPH concentrations were reported at concentrations up to 36 mg/kg, and this highest concentration was qualified by the lab as not resembling typical petroleum product. Oil-range TPH concentrations were less than 49 mg/kg (Table 9). The detected diesel- and oil-range TPH concentrations are below MTCA Method A unrestricted soil cleanup levels and below MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (2,000 and 6,000 mg/kg, respectively).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds.

The sampling and analysis results indicate that soil quality at Trailer Storage Area 4 is not adversely impacted.

3.11 Burn Areas 1 and 2

Objectives

In the January 2005 interview, Mr. Garson indicated that these two disturbed areas, northeast and due east of the MEAN Plant (Figure 2), were historically used as burn areas where off-specification explosives materials were burned. Soil sampling and analysis was completed to evaluate whether soil quality at each location had been adversely impacted.

Sampling and Analysis Completed

At each of the two burn areas, three discrete surface (upper 6 inches) soil samples were collected in August 2005 (BA1-SS1 through -SS3, and BA2-SS1 through -SS3; Figure 9). The six soil samples were analyzed for diesel- and oil-range TPH, total arsenic and lead, and nitroaromatics-nitroamines. Soil samples were also screened for the presence of energetics/explosives compounds using the EXPRAY™ colorimetric test kit.

Sampling and Analysis Results

Arsenic was not detected in any of the soil samples from the two burn areas. Lead concentrations in the six samples ranged from 4.11 to 26.7 mg/kg (Table 10). The detected lead concentrations are below the 250 mg/kg MTCA Method A unrestricted soil cleanup level, and the 118 mg/kg MTCA ecological indicator soil concentration for protection of terrestrial wildlife.

Estimated diesel-range TPH concentrations ranged up to 33.6 mg/kg. Oil-range TPH concentrations ranged from 33.3 to 268 mg/kg; however, all of the reported oil-range concentrations above 80 mg/kg were qualified by the laboratory as not resembling typical petroleum product (Table 10). No evidence of petroleum was apparent during field sampling. This information, coupled with our review of the NWTPH-D chromatograms, indicates that the reported TPH concentrations are attributable primarily to natural organic matter, not petroleum hydrocarbons. The detected diesel- and oil-range TPH concentrations are below MTCA Method A unrestricted soil cleanup levels and the MTCA ecological indicator soil concentrations for protection of terrestrial wildlife (2,000 and 6,000 mg/kg, respectively).

EXPRAY™ screening at the soil sample locations did not detect the presence of energetics/explosives compounds. However, one nitroaromatic compound, 1,3,5-trinitrobenzene, was detected at low estimated concentrations (0.026 to 0.16 mg/kg) in the three soil samples from Burn Area 2; no nitroaromatic-nitroamine compounds were detected in the three samples from Burn Area 1 (Table 10). The detected 1,3,5-trinitrobenzene concentrations are many orders of magnitude below the 210,000 mg/kg MTCA Method B unrestricted soil cleanup level (Table 1).

The sampling and analysis results indicate that soil quality at Burn Area 1 and Burn Area 2 is not adversely impacted.

3.12 Seismic Pond

Objectives

Dyno Nobel's 1994 cleanup report mentioned the presence of a Seismic Pond that was used for testing the quality and reliability of explosives manufactured at the Pacific Powder plant. The exact location and size of the pond were not presented in the report but it was shown to be present in the general area northwest of the Farm House Burn Pit (Figure 2). Ken Dunkin of APPCO indicated that the Seismic Pond consisted of a small semi-circular depression located at the edge of the wetland area. Mr. Dunkin stated that sediment at the bottom of the pond was removed and disposed of off site prior to decommissioning the pond. Dyno Nobel's reports stated the Seismic Pond area was clean, and the soil was being contoured. We have not obtained records containing sampling data for the Seismic Pond. Ed Meeks of MWH Americas Inc., an energetics expert with considerable experience in investigation and cleanup of explosives manufacturing facilities, indicated that soil and water quality typically has not been significantly impacted within seismic ponds located at other Hercules facilities.

During preparation of the RI/FS Work Plan, Mark Johns of Exponent was contracted to help locate the Seismic Pond and provide his observations from Dyno Nobel's cleanup activities. Mr. Johns was able to locate the pond area in the field and provided photographs documenting Dyno Nobel's restoration activities (pulling soil back from the edge of a wetland and grading). Those photographs are provided in the RI/FS Work Plan Addendum.

Because the Seismic Pond area is now a vegetated wetland area, soil sampling via test pits could have been destructive to this habitat. Based on discussion with Ecology during preparation of the RI/FS Work Plan, sampling of shallow groundwater from a hand-driven wellpoint was specified in the Work Plan as the best approach for evaluating environmental quality in the Seismic Pond area.

Sampling and Analysis Completed

A 3-foot-deep wellpoint was installed within the Seismic Pond in late August 2005. The water table was present at a depth of approximately one foot below grade at the time of installation. Following installation, the wellpoint was developed to the extent practical, and then sampled using low flow sampling techniques. The groundwater sample was analyzed for nitroaromatics-nitroamines and nitroglycerin (EPA Method 8330),

perchlorate (EPA Method 314.0), gasoline-, diesel-, and oil-range TPH (NWTPH-G and NWTPH–D extended), eight dissolved metals (arsenic, cadmium, chromium, copper, mercury, lead, nickel, and zinc), total suspended solids (TSS), and a suite of inorganics (nitrate, ammonia, sulfate, sodium, and chloride). Groundwater pH, temperature, dissolved oxygen, oxidation-reduction potential (Eh), and specific conductance were also measured in the field.

The temporary wellpoint remains in place until Ecology concurs with decommissioning it.

Sampling and Analysis Results

The groundwater was observed visually to have relatively low turbidity (consistent with the 90 mg/L TSS concentration), but had a translucent light brown color ("like weak tea") indicative of natural organics (e.g., humics) associated with the wetland setting. After 30 minutes of purging (nearly 50 casing volumes), the field parameter readings for the groundwater sample were:

- pH = 6.4;
- Temperature = 18.9°C;
- Specific conductance = 123 umho/cm;
- Dissolved oxygen = 3.7 mg/L; and
- Oxidation/reduction potential (Eh) = 39 millivolts.

Zinc was the only dissolved metal detected in the groundwater sample; the 11 ug/L detection is below the most stringent potentially applicable water quality screening level (105 ug/L; Table 11).

The natural organics present in the groundwater interfered with laboratory quantification of diesel- and oil-range TPH in the sample. Gasoline-range TPH was non-detect. Diesel- and oil-range TPH concentrations were reported as 344 and 772 ug/L, respectively; however, both results were qualified by the lab as not resembling a typical petroleum product (qualified X2; Table 11). No evidence of petroleum hydrocarbons (odor or sheen) was observed in the field during wellpoint development or sampling. The NWTPH-D chromatogram fingerprint does not match diesel- or oil-range petroleum products; rather, it consists primarily of distinct peaks more indicative of natural organics. It is unlikely that significant dissolved oil-range hydrocarbons would be observed given the very low aqueous solubility of oil-range petroleum products. The "tea" color of the sample is consistent with groundwater containing elevated dissolved natural organics (e.g., humics). Because a silica gel cleanup was not performed on this sample, these natural organics would have been quantified as part of the NWTPH-D analysis. The last section of Appendix B provides discussion of the chromatogram evaluation for the TPH data.

Of the extensive list of energetics/explosives compounds analyzed (nitroaromatics/nitroamines, nitroglycerin, and perchlorate), only one compound was detected in the groundwater sample. The nitroaromatic compound 4-amino-2,6-dinitrotoluene was detected at an estimated concentration of 0.078 ug/L (below the

practical quantitation limit). There are no state groundwater or surface water quality screening levels available for this compound (Table 11). However, the Environmental Protection Agency (EPA) Region 3 has established a 73 ug/L risk-based drinking water concentration for all aminodinitrotoluenes (EPA Region 3 risk based concentration table; April 7, 2005). The estimated 4-amino-2,6-dinitrotoluene concentration in the groundwater sample, below the lab's practical quantitation limit and three orders of magnitude below that risk-based concentration, is not considered to be of environmental significance.

Concentrations of nitrate and other conventionals (ammonia, chloride, sodium, and sulfate) are below respective water quality screening levels (Table 11), and are within the range of reported groundwater concentrations throughout Thurston County (Wallace and Molenaar 1961). The low concentrations of nitrate (0.03 mg/L) and ammonia (0.24 mg/L) are consistent with a lack of residual energetics compounds in this area.

The sampling and analysis results indicate that the Seismic Pond area is not adversely impacted.

4 Conclusion

The extensive environmental characterization data collected in accordance with the RI/FS Work Plan indicate that the subject parcel, comprising approximately 1,456 acres of the 1,625 acre property, has not been adversely impacted by a release of a hazardous substance from the former explosives manufacturing plant on the property. No remedial action or site use restriction would be warranted for the subject parcel based on environmental conditions.

Therefore, Citifor Inc. requests that Ecology remove the subject parcel from the Former Pacific Powder Site as defined in Agreed Order No. 02TCPSR-4523. Redefining the Site to exclude a large area of uncontaminated property would allow more focused and efficient completion of the RI/FS process for the Site.

5 Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Citifor Inc. for specific application to the referenced property. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

6 References

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